



MANIPAL (A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (CS/IT/CC) END SEMESTER EXAMINATIONS, JUNE 2018

SUBJECT: ENGINEERING MATHEMATICS - IV

[MAT -2206]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL questions.
- ✤ All questions carry equal marks.

1A.	Find the probability that among 7 persons: i) no two are born on the same day of the week. ii) at least two were born on the same day of the week. iii) two were born on a Sunday and two on Tuesday.	4
1 B .	The chances of A, B, C becoming the general manager of a certain company are in the ratio 4:2:3. The probabilities that the bonus scheme will be introduced in the company if A, B, C become general manager are 0.3, 0.7, 0.8 respectively. If the bonus scheme has been introduced, what is the probability that A has been appointed as general manager?	3
1C.	If the random variable 'K' is uniformly distributed over [0, 5], what is the probability that the roots of the equation $4x^2 + 4xK + K + 2 = 0$ are real ?	3
2A.	Compute an approximate probability that mean of a random sample of size 15 from a distribution having pdf $f(x) = \begin{cases} 3x^2, & 0 < x < 1\\ 0, & \text{elsewhere} \end{cases}$ is between $\frac{3}{5} \& \frac{4}{5}$.	4
2B.	Two independent random variables X_1 and X_2 have means 5, 10 and variance 4, 9. Find the correlation coefficient between $U = 3X_1 + 4X_2$ and $V = 3X_1 - X_2$.	3
2C.	The income of a group of 10,000 persons was found to be normally distributed with mean Rs.750 and standard deviation of Rs. 50.Find the number of persons out of 10,000 who have income exceeding Rs.668 and those who have income exceeding Rs. 832?.Also, find the lowest income among the richest 100?	3
3A.	Find the mgf of chi-square distribution. Hence find its mean and variance.	4

3B.	The Mendelian theory states that the probabilities of classification A, B, C, D are	
	respectively $\frac{9}{16}, \frac{3}{16}, \frac{3}{16}, \frac{1}{16}$. From a sample of 160 the actual numbers observed	3
	were 86, 35, 26 and 13. Is this data consistent with the theory at 0.01 significance	
	level ?.	
3C.	Let $X_1, X_2,, X_n$ denote the random sample of size n from a distribution having	
	pdf $f(x,\theta) = \begin{cases} \theta^x (1-\theta)^{1-x}; & x = 0,1,; 0 \le \theta \le 1\\ o & Otherwise \end{cases}$. Find the maximum	3
	likelihood estimation for θ .	
4A.	If the random variable X has $N(\mu, \sigma^2)$ distribution, then show that the random	_
	variable $Z = \frac{X - \mu}{\sigma}$ has N(0, 1) and that $V = \frac{(X - \mu)^2}{\sigma^2}$ has $\chi^2(1)$.	4
4B.	Find the mean and variance of Poisson distribution with parameter α .	3
4C.	If \overline{X} is the mean of a random sample of size n from a normal distribution with mean	3
	μ and variance 100. Find n so that $P\left\{\mu-5 < \overline{X} < \mu+5\right\} = 0.954$.	
5A.	Let us assume that the life length of a tire in miles, say X is normally distributed with mean θ and standard deviation 5000. Past experience indicates that $\theta = 30,000$, the manufacturer claims that the tires made by a new procedure have mean $\theta > 30,000$ and it is very possible that $\theta = 35,000$. Let us check this claim by testing H ₀ : $\theta < 30,000$ against H ₁ : $\theta > 30,000$. We shall observe n independent values of X say X ₁ , X ₂ ,, Xn and we shall reject H ₀ if and only if $\bar{x} \ge c$. Determine n and c so that the power function K(θ) of the test has values K (30,000) = 0.01 and K (35,000) = 0.98.	4
5B.	If 8.6,7.9,8.3,6.4,8.4,9.8,7.2,7.8,7.5 are the observed values of a random sample of size 9 from a distribution that is N(8, σ^2), construct 90% confidence interval for σ^2 .	3
5C.	If X is a random variable and $P(x) = ab^x$, where a and b are positive such that $a + b = 1$ and $X = 0, 1, 2,$ Find the moment generating function of X. Hence, show that $m_2 = m_1 (2m_1 + 1)$ where m_1 and m_2 being the first two moments.	3